



Engineering Mechanics Corporation of Columbus  
3518 Riverside Drive – Suite 202  
Columbus, Ohio 43221

Phone: (614) 459-3200  
sq.com

Fax: (614) 459-6800

E-mail: sureshk@emc-

## Sureshkumar Kalyanam

### Research Engineer

#### EDUCATION

Ph.D., Aeronautics and Astronautics, Purdue University, 2004  
M.E., Mechanical Engineering, Indian Institute of Science, 1998  
B.E., Mechanical Engineering, National Institute of Technology, Surathkal, 1995

#### EXPERIENCE OVERVIEW

Dr. Sureshkumar Kalyanam is a Research Engineer with 12 years of experience in the area of development of material models, numerical simulations, and experiments to characterize the behaviour of materials. His work has involved studies on the fracture and failure of materials used to understand the reliability of structures and provide guidelines to make developments in the design of components and devices. Dr. Kalyanam has modeling experience from finite element analysis (FEA) performed to study the deformation and failure behaviour of piezoceramics, metallic alloys, biological materials, and composites. He has experimental experience from the development of experimental techniques, fixtures/setup for testing of material behaviour. Dr. Kalyanam has experience in the process layout and production planning for hydraulic cylinders.

#### EMPLOYMENT HISTORY

##### **October 2009 – Present Engineering Mechanics Corporation of Columbus, Columbus, OH**

###### *Research Engineer*

- Development of experimental and computational techniques towards the assessment of welded structures and related metallic alloys used in the oil and gas industry.
- Modeling the stress corrosion cracking in fabricated welds to assess their reliability under operational loads and transient conditions.
- Supervision and guidance for technicians and engineers performing related experimental and modeling efforts for the assessment of integrity of welded structures.
- Develop and cultivate client relationships to maintain and grow new business, Manage personnel and equipment for projects related to the fracture testing of materials.
- Provide consultant-engineering services to the Nuclear Regulatory Commission (NRC), foreign governments and other utility clients.

##### **February 2009 – October 2009 Dept. of Industrial, Welding & Systems Engineering, The Ohio State University, Columbus, OH**

###### *Post-doctoral Researcher*

- Development of experimental techniques and advanced finite element analysis (AFE) computational methods used to characterize the crack growth resistance in welded materials.

- Experiments on weld materials and base metals to obtain material properties for constitutive models used to study the developed residual stresses and strains in welded structures.

**October 2006 – February 2009 Dept. of Bioengineering, University of Illinois at Urbana-Champaign, Urbana, IL**

*Visiting Research Assistant Professor, Ultrasonics Elasticity Imaging*

- Modeling the poro-viscoelastic behavior of hydrogels, polymeric media, and soft tissues using finite element analysis techniques. Understanding the role of microstructure, on the mechanics of polymeric media, which are similar to soft tissues.
- Developed models and insights into the poro-viscoelastic behavior enable the interpretation of ultrasound elasticity images for early detection of cancerous growth. Developed experimental methods that are used to determine the material properties used to characterize the poro-viscoelastic behavior of polymeric media.
- Supervision of mechanics of materials research of graduate students studying the role of polymeric media in their mechanical behavior.

**June 2004 – September 2006 Dept. of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, Urbana, IL**

*Post-doctoral Research Associate, Computational Fracture Mechanics Research Group*

- Coordinated the efforts for the development of a delamination criterion from experimental work and numerical modeling of delaminations in Aluminum-Lithium alloys
- Incorporated the Yld2004 - 18 parameter Barlat anisotropic plasticity model (obtained as an ABAQUS-UMAT from the ALCOA Technical Center, Pittsburgh, PA, U.S.A.) into the WARP3D FEA research code. Evaluated the effects of delamination cracks on the local deformation, stresses, strains, and fracture toughness.
- Supervision of mechanics of materials research of graduate students studying the role of polymeric media in their mechanical behavior.

**September 1998 – May 2004 School of Aeronautics and Astronautics, Purdue University, West Lafayette, IN**

*Research Assistant, McDonnell Douglas Composite Materials Laboratory*

- Developed experimental setup to test fracture specimens and measure the crack tip opening angle (CTOA) during crack growth at various temperatures (room to 600 C) for metallic alloys.
- CTOA criterion was applied to predict the ductile fracture in metallic alloys at elevated temperatures. FORTRAN and UNIX codes that use the CTOA-crack growth curves were developed and used with ABAQUS to simulate the deformation of thin-walled cylinders subjected to internal pressure at high temperatures.
- Developed an ABAQUS-UEL (user element) to model the electrical permeability of a dielectric medium, which is present in the crack cavity of a piezoelectric fracture specimen during experimentation, to elucidate the effect of electric permeability of the dielectric medium when the fracture specimen has a sizable crack cavity.
- Formulated a material model that captures the nonlinear polarization switching behavior exhibited by polycrystalline piezoceramics, like PZT, which was incorporated in a FORTRAN code to work in conjunction with ABAQUS.

**January 1998 – May 1998 Dept. of Mechanical Engineering, Indian Institute of Science, Bangalore, India**

*Research Associate, Computational Solid Mechanics Laboratory*

- Developed a finite deformation solution algorithm for contact problems using a planar three node gap element technique. Algorithm was implemented in the finite element code, FEA, which is capable of analyzing planar frictionless, sticking, and sliding frictional contact problems and was used to analyze static and dynamic contact problems.

**August 1995 – February 1996 Wipro Fluid Power, Bangalore, India**

*Development and Planning Engineer*

- Worked as a process and planning engineer for verification of drawings, process layouts, and planning of the production of hydraulic cylinders for fork lifts manufactured by Sakai and Furukawa. Led the efforts for improving the process plans to achieve the required quality standards.

**PROFESSIONAL ASSOCIATION/ACTIVITIES**

- Peer Reviewer – Engineering Fracture Mechanics  
Smart Materials and Structures  
Indian Journal of Engineering and Materials Science  
ASME Pressure Vessels and Piping Technology
- Sigma Gamma Tau – National Honor Society for Aerospace Engineers – student member
- American Society of Mechanical Engineers – student member
- American Society of Biomechanics – member

**PUBLICATIONS**

G.M. Wilkowski, D.J. Shim, S. Kalyanam, G. Wall, P. Mincer, D. Rider, F.W. Brust, D.L. Rudland. Using D-C electric potential for crack initiation/growth monitoring during testing of weld metal fracture specimens. *Proc. of Pipeline Technology, Oostende, Belgium, Oct 12-14, 2009.*

S. Kalyanam, A.J. Beaudoin, R.H. Dodds Jr., F. Barlat. Delaminations cracking in advanced Aluminum-Lithium alloys – experimental and computational studies. *Engg. Frac. Mech.*, 76, 2174-2191, 2009.

K.S. Toohey, S. Kalyanam, M.F. Insana. Cross-validation of experimental methodologies to characterize the behavior of hydrogels. *Proc. of SEM, Experimental and Applied Mechanics, Albuquerque, New Mexico, June 2009.*

S. Kalyanam, R.D. Yapp, M.F. Insana. Poro-viscoelastic behavior of gelatin hydrogels under compression - implications for bioelasticity imaging. *ASME Journal of Biomechanical Engineering*, 131, 081005:1-13, 2009.

S. Kalyanam, C.T. Sun. Modeling the fracture behavior of piezoelectric materials using a gradual polarization switching model. *Mechanics of Materials*, 41, 520-534, 2009.

C. Coussot, S. Kalyanam, R.D. Yapp, M.F. Insana. Fractional derivative models for ultrasonic characterization of polymer and breast tissue viscoelasticity. *IEEE Ultrasonics, Ferroelectrics and Frequency Control*, 56, 715-726, 2009.

X. Liang, A. Oldenburg, V. Crecea, S. Kalyanam, M.F. Insana, S.A. Boppart. Modeling and measurement of tissue elastic moduli using optical coherence elastography. *Proc. Of SPIE – Optics in Tissue Engineering and Regenerative Medicine II*, 6858, 03:1-8, 2008.

C. Coussot, S. Kalyanam, R.D. Yapp, M.F. Insana. Kelvin-Voigt fractional derivative (KVFD) model reduces the parameter space for elasticity imaging. *Ultrasonics Symposium, IEEE*, 1204 -1207, Oct 2007.

R.D. Yapp, S. Kalyanam, M.F. Insana. Molecular and structural analysis of viscoelastic properties. *Proc. of SPIE, Medical Imaging*, 6511, Feb 2007.

S. Kalyanam. Electrical permeability and domain switching effect on fracture behavior of piezoelectric material. *Ph.D. dissertation, Purdue University, West Lafayette, U.S.A.*, July 2005.

S. Kalyanam, C.T. Sun. Modeling of electrical boundary condition and domain switching in piezoelectric materials. *Mechanics of Materials*, 37, 769-784, 2005.

C.T. Sun, Z. Jin, S. Kalyanam, N. Bruno, A. Deitmeyer. Prediction of ductile fracture of thin-walled cylinders subjected to localized intense heat. *Technical Report, A374304*, Nov 2004.

S. Kalyanam, C.T. Sun, D.N. Fang. Domain switching near the crack tip in piezoelectric material. *Proc. of SPIE, Smart Structures and Materials*, 4699, 74-85, 2002.

S. Kalyanam and C.T. Sun. Effect of electrical boundary conditions on the domain switching near the crack tip in piezoceramics. *Proc. of SPIE, Smart Structures and Materials*, 3984, 204-215, 2000. (*Invited paper*)

S. Kalyanam. Finite element modeling of contact problems. *M.S. Dissertation. Indian Institute of Science, Bangalore, India*, Jan 1998.